CLEAN SET OF COMPLETE CLAIMS

1. An in vitro system that recapitulates regulated RNA deadenylation and degradation of an exogenously added preselected target 3' polyadenylated messenger RNA sequence comprising:

(a) a cytoplasmic extract supernatant from a 100,000 x g, 1 hour centrifugation isolated from eukaryotic cells or tissues, said extract depleted of activity of proteins that bind polyadenylate;

(b) a source of ATP; and

(c) an exogenous target 3' polyadenylated messenger RNA sequence.

2. The system of claim 1 wherein said regulated RNA deadenylation and degradation is selected from the group consisting of AU-rich element regulated RNA deadenylation and degradation and C-rich element regulated deadenylation and degradation.

4. The system of claim 1 wherein said cytoplasmic extract is obtained from a cell line selected from the group consisting of HeLa cells and a T cell line.

5. The system of claim 1 wherein said cytoplasmic extract is prepared from cells comprising foreign nucleic acid.

6. The system of claim 1 wherein said cytoplasmic extract is prepared from cells which are infected, stably transfected, or transiently transfected.

9. The system of claim 1 wherein said cytoplasmic extract is selected from the group consisting of:

(a) a cytoplasmic extract which contains polyadenylate competitor RNA;

(b) a cytoplasmic extract which contains a material that sequesters proteins that

bind polyadenylate;

(c) a cytoplasmic extract which contains a proteinase that inactivates proteins that bind to polyadenylate; and

(d) a cytoplasmic extract which contains an agent that prevents the interaction between polyadenylate and an endogenous macromolecule that binds to polyadenylate.

10. The system of claim 9 wherein the material that sequesters proteins that bind polyadenylate is selected from the group consisting of:

(a) antibodies to proteins that bind polyadenylate;

(b) polyadenylate; and

(c) a combination of antibodies to proteins that bind polyadenylate, and polyadenylate.

11. The system of claim 10 wherein said material is attached to a matrix.

14. The system of claim 1 wherein said target 3'polyadenylated messenger RNA sequence is selected from the group consisting of an unlabeled 3'polyadenylated messenger target RNA sequence, a labeled 3'polyadenylated messenger target RNA sequence, and a combination thereof.

15. The system of claim 14 wherein said labeled target 3'polyadenylated messenger RNA sequence is labeled with a moiety selected from the group consisting of a fluorescent moiety, a visible moiety, a radioactive moiety, a ligand, and a combination of fluorescent and quenching moieties.

17. The system of claim 1 wherein said source of ATP is exogenous.

18. The system of claim 1 further comprising a reaction enhancer.

19. The system of claim 18 wherein said reaction enhancer is selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone and dextran.

20. The system of claim 19 wherein said reaction enhancer is polyvinyl alcohol.

21. A method for identifying an agent capable of modulating the stability of a target 3' polyadenylated messenger RNA sequence comprising

(a) providing the system of claim 1;

(b) introducing said agent into said system;

(c) determining the extent of deadenylation and degradation of said target 3' polyadenylated messenger RNA sequence; and

(d) identifying an agent able to modulate the extent of deadenylation and degradation as capable of modulating the stability of said target 3' polyadenylated messenger RNA sequence.

23. The method of claim 21 wherein said source of ATP is exogenous.

24. The method of claim 21 wherein said agent is an RNA stability modifying molecule.

25. The method of claim 21 wherein said target 3' polyadenylated messenger RNA sequence is selected from the group consisting of an unlabeled target 3' polyadenylated messenger RNA sequence, a labeled target 2' polyadenylated messenger RNA sequence, and a combination thereof.

26. The method of claim 25 wherein said labeled target 3' polyadenylated messenger RNA sequence is labeled with a moiety selected from the group consisting of a fluorescent moiety, a visible moiety, a radioactive moiety, a ligand, and a combination of fluorescent and quenching moieties.

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27. The method of claim 21 wherein said monitoring the extent of deadenylation and degradation of said target 3' polyadenylated messenger RNA sequence comprises determining the extent of degradation of said labeled target 3' polyadenylated messenger RNA.

28. The method of claim 21 wherein said modulating the stability of a target 3' polyadenylated messenger RNA sequence increases the stability of said target RNA sequence.

29. The method of claim 21 wherein said modulating the stability of a target 3' polyadenylated messenger RNA sequence decreases the stability of said RNA sequence.

30. The method of claim 21 wherein said agent is capable of modulating the activity of a AU rich element binding protein or a C-rich element binding protein.

31. The method of claim 30 wherein said AU rich element binding protein is selected from the group consisting of a member of the ELAV protein family; AUF1; tristetraprolin; AUH; TIA; TIAR; glyceraldehyde-3-phosphate; hnRNP C; hnRNP A1; AU-A; and AU-B.

32. The method of claim 31 wherein said member of the ELAV protein family is selected from the group consisting of HuR, Hel-N1, HuC and HuD.

33. A method for identifying an agent capable of modulating the stability of a target 3' polyadenylated messenger RNA sequence in the presence of an exogenously added RNA stability modifier comprising

(a) providing the system of claim 1;

(b) introducing said RNA stability modifier into said system;

(c) introducing said agent into said system;

(d) determining the extent of deadenylation and degradation of said 3' polyadenylated

messenger RNA sequence; and

(e) identifying an agent able to modulate the extent of deadenylation and degradation as capable of modulating the stability of said target 3' polyadenylated messenger RNA sequence in the presence of said exogenously added RNA stability modifier.

35. The method of claim 33 wherein said source of ATP is exogenous.

36. The method of claim 33 wherein said target 3' polyadenylated messenger RNA sequence is selected from the group consisting of an unlabeled target 3' polyadenylated messenger RNA sequence, a labeled target 3' polyadenylated messenger RNA sequence, and a combination thereof.

37. The method of claim 36 wherein said labeled target 3' polyadenylated messenger RNA sequence is labeled with a moiety selected from the group consisting of a fluorescent moiety, a visible moiety, a radioactive moiety, a ligand, and a combination of fluorescent and quenching moieties.

38. The method of claim 36 wherein said determining the extent of deadenylation and degradation of said 3' polyadenylated messenger RNA sequence comprises determining the extent of degradation of said labeled target 3' polyadenylated messenger RNA.

39. The method of claim 33 wherein said RNA stability modifier increases the stability of said target 3' polyadenylated messenger RNA sequence.

40. The method of claim 39 wherein said agent decreases the stability of said target 3' polyadenylated messenger RNA sequence increases by said RNA stability modifier.

41. The method of claim 33 wherein said RNA stability modifier decreases the stability of said target 3' polyadenylated messenger RNA sequence.

42. The method of claim 41 wherein said agent increases the stability of said target 3' polyadenylated messenger RNA sequence decreased by said RNA stability modifier.

43. The method of claim 33 wherein said agent is capable of modulating the activity of a AU rich element binding protein or a C-rich element binding protein.

44. The method of claim 43 wherein said AU rich element binding protein is selected from the group consisting of a member of the ELAV protein family; AUF1; tristetraprolin; AUH; TIA; TIAR; glyceraldehyde-3-phosphate; hnRNP C; hnRNP A1; AU-A; and AU-B.

45. The method of claim 44 wherein said member of the ELAV protein family is selected from the group consisting of HuR, Hel-N1, HuC and HuD.

46. A method for identifying an agent capable of modulating regulated deadenylation of a target 3' polyadenylated messenger RNA sequence comprising

(a) providing a system that recapitulates regulated RNA deadenylation of an exogenously added preselected target 3' polyadenylated messenger RNA sequence comprising

(i) a cytoplasmic extract supernatant from a 100,000 x g, 1 hour centrifugation isolated from eukaryotic cells or tissues, said extract depleted of activity of proteins that bind polyadenylate;

(ii) said target 3' polyadenylated messenger RNA sequence;

(b) introducing said agent into said system;

(c) monitoring the deadenylation of said target 3'polyadenylated messenger RNA sequence in said system; and

(d) identifying an agent able to modulate the extent of said deadenylation as capable of modulating the regulated deadenylation of said target 3'polyadenylated messenger RNA sequence.

47. A method for identifying an agent capable of modulating the deadenylation and degradation of a target 3'polyadenylated messenger RNA sequence comprising

(a) providing the system of claim 1;

(b) introducing said agent into said system;

(c) monitoring the deadenylation and degradation of said target 3'polyadenylated messenger RNA sequence in said system; and

(d) identifying an agent able to modulate the extent of said deadenylation and degradation as capable of modulating the deadenylation and degradation of said target RNA sequence.

51. A method for determining whether an endogenous molecule modulates deadenylation or degradation of a target RNA sequence comprising

(a) providing the system of claim 1 containing target 3'polyadenylated messenger RNA;

(b) introducing said endogenous molecule into said system; and

(c) monitoring the stability of said target 3' polyadenylated messenger RNA sequence in said system thereby determining whether said endogenous molecule is capable of modulating deadenylation and degradation.

52. The method of claim 51 wherein said molecule suspected of participating in the deadenylation or degradation of RNA or regulation thereof is protein or RNA.

53. A kit for monitoring the stability of a preselected exogenous target 3' polyadenylated messenger RNA sequence under conditions capable of recapitulating regulated RNA deadenylation and degradation, said kit comprising:

(a) cytoplasmic extract supernatant from a 100,000 x g, 1 hour centrifugation, said extract depleted of activity of proteins that bind polyadenylate;

(b) other reagents; and

(c) directions for use of said kit.

54. The kit of claim 53 further comprising nucleotide triphosphates, a reaction enhancer, a target RNA sequence, or any combination thereof.

55. A method for determining whether an agent is capable of modulating the degradation of a target 3' polyadenylated messenger RNA sequence in the absence of deadenylation comprising

(a) providing a cytoplasmic extract supernatant from a 100,000 x g, 1 hour centrifugation isolated from eukaryotic cells or tissues, said extract depleted of activity of proteins that bind polyadenylate; a source of ATP; and an exogenous target 3' polyadenylated messenger RNA sequence;

(b) introducing said agent into said cytoplasmic extract; and

(c) monitoring the degradation of said target 3' polyadenylated messenger RNA sequence in said extract thereby determining whether said agent is capable of modulating said degradation.

56. The method of claim 51 wherein the endogenous molecule capable of modulating deadenylation and degradation is an isolated molecule.